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Evaluation of the ASVAB 8/9/10 Clerical Composite for Predicting Training School Performance

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The composite of Armed Services Vocational Aptitude Battery (ASVAB) subtests used to select applicants for entry-level training in Army clerical schools was evaluated by correlating composite scores with training performance scores. The clerical composite (CL) had high validity (r = .68) for this criterion but an alternate composite of Arithmetic Reasoning, Paragraph Comprehension, and Mathematics Knowledge scores produced from multiple regression analyses had even higher validity (r = .74). Differential prediction for classification purposes is discussed.

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FOREWORD

The Army Research Institute has ongoing responsibility for monitoring the validity and utility of the Armed Services Vocational Aptitude Battery (ASVAB) Aptitude Area Composites used to select and place applicants in particular training Military Occupational Specialties (MOSs). With the diminishing available human resources and increasing technological aptitude requirements of Army duties, review of enlistment standards has become essential to manning a prepared defense force.

The present Technical Report is provided in response to a request from the Deputy Chief of Staff for Personnel (DCSPER) to evaluate the aptitude area composite (clerical [CL]) used to place Army applicants into clerical MOS training. The results suggest that the addition of a mathematics component to the composite could improve prediction of training performance. The immediate purpose of this report is to document advice provided to the DCSPER regarding potential improvements in the use of classification tests in order to increase training performance and to reduce attrition in Army schools.

EDGAR M. JOHNSON
Technical Director

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EVALUATION OF THE ASVAB 8/9/10 CLERICAL COMPOSITE FOR PREDICTING TRAINING SCHOOL PERFORMANCE

EXECUTIVE SUMMARY

Requirement:

To evaluate the composite of ASVAB subtests currently used to place Army applicants into clerical training schools.

Procedure:

Correlation and multiple regression analyses were used to produce combinations of subtests most predictive of higher quality training performance. Comparisons were made between the multiple $\underline{R}$ for this optimal set of predictors and that for the composite of subtests currently used for clerical classification.

Findings:

In 9 of the 12 MOS samples studied, a mathematics subtest (either Arithmetic Reasoning or Mathematics Knowledge) had the highest single-predictor validity correlation with course grade criteria. When the MOS subsamples were combined, a composite of Arithmetic Reasoning, Paragraph Comprehension, and Mathematics Knowledge test scores had the highest multiple $\underline{R}$ (.74) with the criterion, significantly higher than the correlation obtained for the composite of subtests currently used (.68).

Utilization of Findings:

This report will be used by the Deputy Chief of Staff for Personnel to consider modifications of the clerical aptitude area composite (CL) that would raise the expected performance of soldiers in clerical occupations.

EVALUATION OF THE ASVAB 8/9/10 CLERICAL COMPOSITE FOR PREDICTING TRAINING SCHOOL PERFORMANCE

CONTENTS

EVALUATION OF THE ASVAB 8/9/10 CLERICAL COMPOSITE FOR PREDICTING TRAINING SCHOOL PERFORMANCE

OVERVIEW

This report documents test validation research undertaken by the U.S. Army Research Institute (ARI) at the direction of the Army Deputy Chief of Staff for Personnel. The research was designed to evaluate the effectiveness of the clerical aptitude area composite (CL) currently used to classify soldiers entering clerical Military Occupational Specialties (MOSs). The clerical aptitude area is a composite of subtests appearing on the Armed Services Vocational Aptitude Battery (ASVAB) forms 8/9/10.

The ASVAB is a battery of 10 subtests (see Table 1) that are combined in different ways for use as selection and classification composites. One set of four subtests is known as the Armed Forces Qualification Test (AFQT) and is used to screen applicants for eligibility for military service. After meeting the AFQT criterion for selection, an Army applicant must achieve a passing score on an aptitude area composite for placement into a particular training specialty.

For clerical training, the Army uses the clerical composite (CL), which consists of the four subtests of Word Knowledge (WK), Paragraph Comprehension (PC), Numerical Operations (NO), and Coding Speed (CS). Sample items for each of the 10 ASVAB subtests are given in Appendix A.

Recent emphasis in Army training has been on criterion-referenced testing, which has produced dichotomous pass/fail scores (Maier, 1981). Such scores do not display adequate variance among individuals to reflect differences in levels of performance. The training criteria used in this report were part of a special data collection undertaken to obtain continuous criterion scores suitable for validation.

The purposes of this research were (1) to validate the operational clerical composite of ASVAB 8/9/10 subtests against school performance in Army entry-level enlisted clerical MOSs, and (2) to identify and evaluate possible alternative composites that can predict clerical training school performance.

BACKGROUND

The current CL composite has evolved from a series of research projects on enlisted classification conducted since World War II. Table 2 presents a summary of relevant validation research on the clerical MOS. The earliest composite used to classify Army clerical positions consisted of a reading vocabulary test, an arithmetic reasoning test, and a coding speed test. This reflected job analysis (Trump, Marion, & Karcher, 1957), which found that perceptual speed, number facility, memory, and perceptual patterning were the important components in clerical jobs.

At the beginning of World War II, a general ability construct was considered most predictive of performance in training (PRS 808, 1947). Later,

Table 1

Description of the Subtests in ASVAB 8/9/10

Subtest name	Content	Number of items	Test time (min.)
Word Knowledge (WK)[a]	Understanding the meaning of words, i.e., vocabulary	35	11
Arithmetic Reasoning (AR)[a]	Word problems emphasizing mathematical reasoning rather than mathematical knowledge	30	36
Paragraph Comprehension (PC)[a]	Understanding the meaning of paragraphs	15	13
Numerical Operations (NO)[a]	A speeded test of four arithmetic operations: addition, subtraction, multiplication, and division.	50	3
General Science (GS)	Knowledge of the physical and biological sciences	25	11
Electronics Information (EI)	Knowledge of electronics and radio principles	25	24
Mathematics Knowledge (MK)	Knowledge of algebra, geometry, and fractions	25	24
Auto-Shop Information (AS)	Knowledge of auto mechanics, shop practices, and tool functions	25	11
Coding Speed (CS)	A speeded test of matching words and numbers	84	7
Mechanical Comprehension (MC)	Understanding mechanical principles such as gears, levers, and pulleys	25	19

[a]Tests in Armed Forces Qualification Test (AFQT).

Table 2

Summary of Military Validation Research on Clerical MOS

Criterion	Test version (dates used)	Predictor	Correlation	Occupation (sample size)	Reference
Training scores	AGCT (1940-1949)	AGCT RV+AR-ACS	.62 .45	Clerk (2,329)	Fuchs (1949)
Final course grades	ACB-49 (1949-1956)	RV+AR+ACS	.73	Clerk (n/a)	Woods & Neuder (1955)
Final course grades	ACB-56	RV+AR+ACS	.58 .69 .76 .72 .70 .72	Steno (1,138) Pers. adm. (572) Pers. Mgmt. (1,112) Admin. (801) Acctg. (738) Postal (588)	Woods (1956)
Final course grades	ACB-58	ACS RV AR	.53 .60 .66	Clerical (13 courses)	Helme (1960)
Average written test score		VE+ACS/2 Maximum validity	.80 .85	Clerical (1,043)	Helme (1963)
Performance ratings in practicum aspects		VE AR VE+ACS	.76 .68 .82		Helme (1963)
Typing test	AQB (1961-1972)	CS ACS (total) Number reversal Coding	.45 .35 .22 .37	General Clerk 70A10 (460)	Frankfeldt (1970)
Final course grades	ACB-73 (1973)	CL = AR+WK+AD+CA Maximum validity	.68 .78	Clerical (25,000)	Maier & Fuchs (1972)
Final course grades	ASVAB 1 (1968)	Administrative Index	.86	Clerical (Air Force) (1,778)	Vitola, Mullins & Croll (1973)
Time-to-train	ASVAB 6/7 (1976-1980)	WK+AD WK+AD+NO	-.27 -.36	Clerical (129) (Navy)	Swanson (1979)
Final course grades	ASVAB 8/9/10 (1980-present)	MK AR NO WK VE+CS+NO	.55 .53 .51 .50 .55	Clerical (304)	Maier & Grafton (1981)
Final course grades	ASVAB 8/9/10	CL = VE+CS+NO	.63 .44	73C (188) 75B (162)	Wagner, Dirmeyer & Means (1982)
Time to complete			-.48	75B (162)	

AGCT = Army General Classification Test
ACB = Army Classification Battery
AQB = Army Qualification Battery
RV = Reading and Vocabulary
AR = Arithmetic Reasoning
ACS = Army Coding Speed
AD = Attention-to-Detail
CA = Interest Inventory (Attentiveness)
VE = Verbal
NO = Numerical Operations
MK = Mathematics Knowledge
CS = Coding Speed

as the available labor force pool decreased, test developers attempted to design composites that would tap aptitudes (such as perceptual speed) that would be relevant to specific occupational skills.

When the aptitude area system was reconstituted in 1958, each composite contained only two tests, one measuring general ability and one measuring a specialized aptitude. For clerical positions, the composite was Verbal (VE) + Army Coding Speed (ACS) (Maier & Fuchs, 1969). When the composites were again reevaluated in 1969, additional tests were added to improve the validity of the composites, again making their content more general (Maier & Fuchs, 1972). The testing philosophy of this time reflected a desire to distribute general mental ability equitably across all the MOS groups and to use the classification composites as a secondary screen for applicants of marginal ability.

Although the composition of the subtests and their relative weighting in the clerical composite varied over the years, the same aptitude dimensions (verbal, math, clerical speed) were included until about 1973. At that time, a new classification system was inaugurated. For the new battery, the Army Classification Battery-1973 (ACB-73), the aptitude area composites were constructed to have maximum absolute validity for predicting training performance. Each composite had at least one test of general ability; at least two of the subtests in each composite required the ability to read. However, the cost of building literacy into each composite was that the composites were highly intercorrelated.

The same aptitude composites developed for ACB-73 were also used for ASVAB 6/7, introduced in 1976. For the current forms (ASVAB 8/9/10), Maier and Grafton (1981) built new aptitude area composites by using parallel predictor subtests from ASVAB 6/7 and validating against measures of job proficiency and training success.

Research on clerical jobs in the civilian sector has found results similar to those from research in the military. In the Federal Civil Service, for example, clerical workers have been selected using a test that included vocabulary, paragraph comprehension, alphabetizing, simple mathematics, and typing scales (U.S. Civil Service Commission, 1973). In an early review, Bennett and Cruikshank (1949) concluded that the best predictor for clerical occupations was a test of general mental ability in combination with a test of perceptual speed. Validation research in the clerical area has generally found validity coefficients between such test scores and training/job success to be quite high. Ghiselli (1966) reported that test validities for proficiency and training criteria in clerical occupations were on the order of .75 across test types. Pearlman (1979) collected nearly 3,400 validity coefficients from 700 studies involving a total sample size of over 470,000. For training performance criteria, he found higher corrected mean validities for measures of verbal ability ($\underline{r}$ = .65), quantitative ability ($\underline{r}$ = .71), reasoning ability ($\underline{r}$ = .40), memory ($\underline{r}$ = .59), and perceptual speed ($\underline{r}$ = .40) than for such measures as motor ability ($\underline{r}$ = .35) and spatial ability ($\underline{r}$ = .38). This may be due to the relatively academic orientation of most clerical training programs.

The impetus for the current validation effort stems from recent emphasis on optimizing the use of the Army's personnel resources. Because of the

large number of clerical soldiers the Army trains each year (18,000 in Fiscal Year 1981 [FY81]), even modest increments in validity can have a dramatic payoff in monetary savings attributable to higher performance and lower training attrition costs.

METHOD

Subjects

Subjects were 3,978 new trainees entering the Army for clerical training in FY 81. Only subjects having ASVAB 8/9/10 scores on record were used because previous forms of the ASVAB were not being validated in this research. Twelve of the 20 MOSs that use CL for classification were represented in this sample; the remaining 8 specialties had to be excluded because of either small sample size or inadequate variance in the criterion measures. Table 3 describes the 12 MOS subsamples and shows sample sizes as well as predictor and criterion means and standard deviations (*SDs*).

Measures

Predictors. Predictor measures were the 10 ASVAB subtest scores, which were transformed to standard scores using a standard Army conversion table. Table 1 provides a description of these subtests.

Criteria. End-of-course grades were used to measure training performance. These scores were standardized within each MOS to permit comparison across MOSs. Disposition categories, such as graduates, recycles (who retake the same course), transfers (who attempt training in a different course), and failures, were used to set replacement scores as defined below. The graduate/nongraduate dichotomy was used as a secondary performance criterion for validation.

Procedures

Data were edited to remove certain cases: scores for students who did not complete training for medical or disciplinary reasons, scores that were out of range, and repeated measures on students who recycled through training. A score replacement technique, following a rationale developed by Maier (1968), was used to reduce the error variance in criterion scores. Since the score of record for a student who failed to complete the course may have represented only a partial score achieved up to that point in training, scores for recycles, transfers, and reliefs were replaced. A recycle is a student who attempts training in the same course a second time; a transfer is a student who is moved to a different course of training; and a relief is a student who is discharged without further attempts at training.

For recycles, a score that was one-half standard deviation below the mean of the graduates was substituted for the score of record. For reliefs and transfers, a score that was one standard deviation below the mean was substituted. About 5% of the total sample was involved in a substitution of this type.

Table 3

Sample Clerical MOS Predictor and Criterion Scores

MOS	Title	Sample size	CL score minimum	CL Mean	CL SD	Criterion	Criterion Mean	Criterion SD
71D	Legal clerk	103	110	119	8.5	Course GPA	80	13.4
71M	Chapel activities specialist	98	95	107	10.5	Course GPA	83	10.6
71N	Traffic management specialist	131	95	103	8.4	Course GPA	84	10.2
73C	Finance specialist	214	95	106	11.3	Course GPA	93	6.9
75B	Personnel administration specialist	525	95	106	9.3	Course GPA	86	11.1
75C	Personnel management specialist	101	95	107	9.9	Course GPA	84	12.1
75D	Personnel records specialist	238	95	103	8.9	Course GPA	85	8.5
75E	Personnel actions specialist	296	95	108	10.5	Course GPA	84	6.7
76C	Equipment records & parts specialist	1,215	95	99	8.5	End-of-course test score	87	6.9
76J	Medical supply specialist	99	95	104	8.5	Percent of total points first time tested (10 tests)	86	8.4
76P	Material control & accounting specialist	618	90	96	7.9	End-of-course test score	87	5.0
76W	Petroleum supply specialist	340	90	91	5.2	Course GPA	92	4.5

Having standardized and edited the scores, we then computed covariance matrices and corrected the subtest-course grade correlations for restriction in range of the predictor scores using a method described by Lord and Novick (1968). For an unrestricted population reference, the correlation matrix derived from the 1980 Profile of American Youth (Wagner, 1982) was used (see Appendix C). No other corrections were made.

A final procedural decision was how best to combine the information from the 12 individual MOS regressions. Two methods of weighting the subsamples were compared: one weighted the 12 MOSs equally; the other weighted by the MOS sample size, which reflected MOS accession size.

Analyses

Descriptive statistics (means, standard deviations) for each MOS were calculated for the predictor (CL) and criterion (course grade). Frequency distributions were examined for normality, skew, and kurtosis. Multiple correlation and regression analyses were performed for each MOS and for the total combined sample to predict course grades from ASVAB subtest scores. The corrected covariance matrices were used to derive regression equations using stepwise procedures (Hull & Nie, 1981). The multiple correlation between the current composite (WK + PC + CS + NO) and criterion scores was compared with that for an alternate unit-weighted, revised composite suggested by the regression analyses. The stability of the regressions was tested by dividing the two largest MOSs in half randomly and developing a prediction equation on one-half of the sample and cross-validating on the other half.

Differential prediction by sex was examined by comparing the slopes, intercepts, and standard errors of estimate of regression lines developed separately for males and females. These lines were computed from a unit-weighted composite of predictors--Arithmetic Reasoning (AR), Paragraph Comprehension (PC), and Mathematics Knowledge (MK)--regressed against course grade. Subgroup analyses by race were not performed because of ambiguity in the coding of racial categories.

For the pass/fail criterion, simple chi-square analyses were performed to evaluate the predictors' ability to separate students who successfully complete training from those who do not.

Utility analyses were modeled after Brogden (1946) and Cronbach and Gleser (1965) following an equation developed by Hunter and Schmidt (1982) for computing the potential utility of a selector by means of a continuous criterion. Here, the value of an increase in performance (ΔU) due to use of a valid test is a function of the number selected (N), the validity coefficient (R_{xy}), the average standard score on the test for those selected ($\bar{Z}_x$), and the standard deviation of criterion performance in dollars (SD_y) (Hunter & Schmidt, 1982). It is assumed that the relationship between the test scores and training performance is linear.

The total productivity gain is

$$\Delta U = N\, R_{xy}\, SD_y\, \bar{Z}_x .$$

RESULTS

Inspection of the frequency distributions of standardized course grades revealed that, as might be expected in criterion-referenced testing, the grade distributions were negatively skewed. This skew may be a result of the schools' use of criteria that maximized the proportion of students who successfully completed training. Because no attempt was made to normalize the distributions, the obtained validities may underestimate the true relationships.

Table 4 presents the results of the correlation, regression analyses, and composite comparisons. All coefficients reported have been corrected for restriction in range. Part A of Table 4 lists the correlation between each of the individual subtests and the course grade criterion for the designated MOS. The highest single predictor validities were observed for the AR and MK subtests. For the total sample, AR alone predicted training school course grades as efficiently ($r = .69$) as the four subtests of the current composite ($r = .68$). Lowest subtest validities were found for Auto-Shop Information (AS) and Electronics Information (EI).

Part B of Table 4 displays the results of the multiple regressions, using the Statistical Package for Social Sciences (SPSS) forward regression method. For example, for MOS 71D, WK correlated .49 with course grade; next MK entered the regression, increasing the multiple correlation to .52, followed by AS, and so forth. The multicollinearity of ASVAB subtests makes interpretation of the regressions problematical. However, a common result across 9 of the 12 individual MOS regressions was that a mathematics (either AR or MK) subtest consistently accounted for the most variance in course grades. Simply adding AR to the current composite raised its validity from .68 to .73.

In an effort to locate the best composite for all 12 MOSs, we combined the results of the individual MOS validations. Since the relative importance of the individual MOS was not determined a priori, two weighting methods were compared for pooling data across MOSs: weighting MOSs by sample size and weighting the MOSs equally. Results of both of the pooled-sample regressions (SPSS stepwise method) were quite similar for either method of weighting MOS subsamples. A composite of three subtests--AR, PC, and MK--predicted approximately 50% of the variance in course grades, with multiple $R = .74$. This multiple correlation depends on equalizing the means of the 12 MOSs and using beta-weighted predictors in the regression equation. By comparison, the subtests of the current composite (WK, PC, CS, NO) correlated significantly ($p < .01$) lower (.68) with course grades.

Using the utility formula, $\Delta U = N\, R_{xy}\, SD_y\, \bar{Z}_x$, the savings attributable to using an improved CL composite can be estimated by substituting

$R = .68$ (for existing CL composite)
$R = .74$ (for improved composite)
$SD_Y = \$1,000$; $\bar{Z}_x = 1$; $N = 18,000$

where N is the number of clerical accessions in FY 81. The value of performance SD_y was not determined empirically but was inferred to be \$1,000, based on estimates of training performance in similar clerical positions

Table 4

Correlation and Regression Analyses[a]

MOS	71D	71M	71N	73C	75B	75C	75D	75E	76C	76J	76P	76W
N	103	98	131	214	525	101	238	296	1,215	99	618	340
A. Correlations between ASVAB subtests and training school course grades by MOS												
Subtest												
AR	47	69	72	51	37	46	53	66	51	78	66	65
WK	49	65	67	41	33	51	40	66	47	66	58	63
PC	47	65	67	44	30	45	40	65	44	65	57	55
NO	30	65	66	40	27	37	28	60	39	63	49	53
GS	40	64	63	38	34	46	44	61	46	69	53	59
CS	27	66	64	32	23	42	28	54	32	55	48	47
AS	16	33	38	26	29	31	38	43	37	47	31	53
MK	47	68	71	46	36	49	47	65	50	80	69	60
MC	28	48	52	33	28	42	44	48	43	54	47	57
EI	40	52	56	32	31	45	43	53	44	54	45	58
B. Multiple regression Rs (successive stepwise)												
	WK 49	AR 69	AR 72	AR 51	AR 36	WK 51	AR 53	WK 66	AR 51	MK 80	MK 69	AR 65
	MK 52	CS 78	CS 79	PC 53	AS 39	MK 55	AS 54	MK 72	WK 53	AR 82	PC 71	WK 69
	AS 54	GS 79	PC 80	NO 53	MK 40	CS 56	MK 54	NO 74	MK 54	CS 83	AR 72	AS 71
	EI 56	MK 80	MK 81	EI 54	MC 40	EI 57	NO 55	PC 74	AS 55	GS 84	CS 72	CS 72
C. Predictor composites' R (unit weights used)												
CL	45	77	78	46	33	52	40	72	48	73	62	64
AR+PC+MK	52	75	78	52	38	52	52	73	54	82	67	67

[a]Coefficients corrected for restriction in range.

(Hunter & Schmidt, 1982). Assuming selection is made at .3 SD above the mean (Z = .3, ϕ = .381, p = .382, $\bar{Z}_x$ = 1) and projecting these figures on future clerical accessions, the potential savings to the Army for increasing validity from the .68 of the current composite to .74 for the new composite is more than $1 million each year the improved composite is used.

Operationally, unit-weighted composites have generally been preferred to the less stable beta-weighted composite scores. To evaluate the prediction using unit-weighted subtests, the correlation between obtained course grades and those predicted from a unit-weighted composite of AR, PC, and MK were compared to similar correlations using the CL subtests (WK, PC, CS, and NO). These correlations are listed in the lower section of Table 4 to show the composites' relative predictive efficiency across the 12 MOS samples. MOS 75B, for example, had the lowest multiple correlation coefficient; 76J had the highest. The revised composite improved prediction in 7 of the 12 MOSs but did not significantly alter the rank order of the multiple correlation coefficients of the 12 specialties. Cross-validation in two large-sample MOSs obtained corrected correlations of .52 for 76C and .68 for 76P.

The check for differential prediction by sex revealed that, at lower composite scores, the regression line of a unit-weighted composite of AR + PC + MK against course grade for females lay above the regression line for males (see Figure 1), suggesting possible underprediction for women scoring below the composite mean. The following male and female subgroup statistics were significantly different ($p < .01$): validities (r_m = .396, r_f = .316), predictor SDs (σ_m = 10.1, σ_f = 9.08) and criterion SDs (σ_m = 19.93, σ_f = 19.68). The difference in standard errors of estimate of the two groups (ε_f = 18.68; ε_m = 18.29) surpassed the chance level (F = 1.043, df = 3,145,835, $p < .01$), perhaps because of the large sample size. However, the two regression lines did not differ significantly in slopes or intercepts. Stepwise regression for females (n = 836) produced the predictors MK, AR, and NO for a corrected multiple R of .40, while the regression for males (n = 3,147) produced AR, AS, and MK for a multiple R of .42. Two of the subtests, AR and MK, are common to the regressions for both sexes. Differences in the third predictor as well as the absence of PC may be attributable to subtest multicollinearity.

The second performance criterion, the dichotomous pass/fail separation, was analyzed using chi-square tests. Schools were found to vary greatly in their attrition rates (see Table 5). Some reported virtually no attrition (76W, 73C) while others (75D, 75E) had more than 20% attrition. Schools also differed in disposition methods, for example, whether a student having been unsuccessful in completing course requirements recycled through the same course or attempted other training.

To evaluate whether composite scores could distinguish between students who complete training successfully and those who fail, composite score distributions for graduates and nongraduates were compared. Here, graduates include both regular and accelerated graduates, and nongraduates include any students who recycled, transferred, or were relieved from duty. Using the current CL composite subtests, significant differences between graduates and nongraduates were found for two MOSs: 71D (χ^2 = 17.4, $p < .003$) and 75E (χ^2 = 12.7, $p < .03$). When an alternative composite of AR, PC, and MK was used, significant differences were found for 5 of the 12 MOSs: 71D

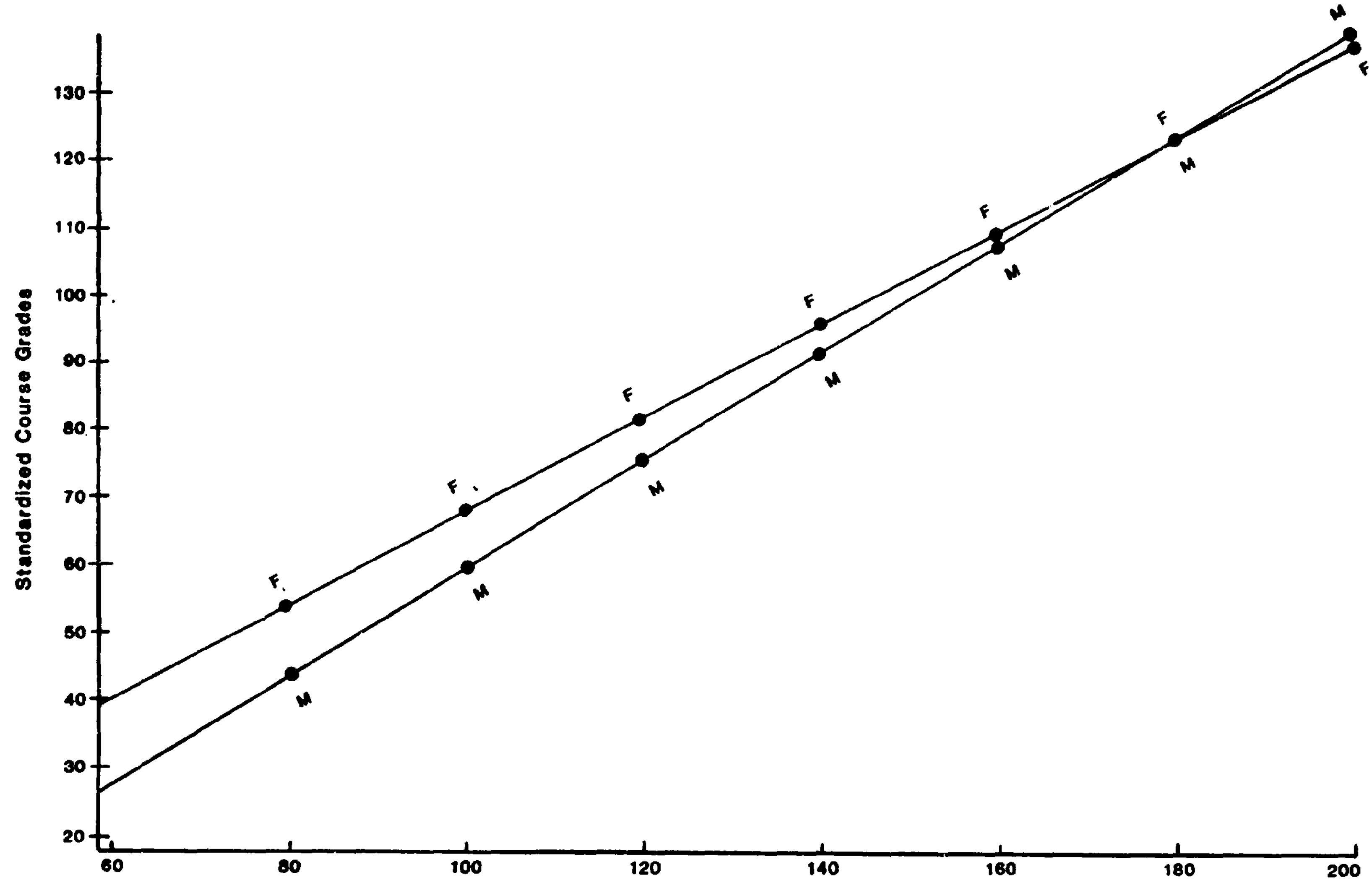

Figure 1. Regression lines for AR + PC + MK.

M = Male
F = Female

($\chi^2 = 22.8$, $p < .0001$), 71M ($\chi^2 = 26.6$, $p < .0001$), 75D ($\chi^2 = 12.5$, $p < .01$), 75E ($\chi^2 = 28.2$, $p < .0001$), and 76C ($\chi^2 = 45.9$, $p < .0001$). Despite these significant chi-squares, the overlap of composite distributions for total sample graduates and nongraduates is high (see Figure 2).

Table 5

Failure Rate by MOS

MOS	N	% Attrition[a]	Recycles	Reliefs	Transfers
71D	103	17.1	1.0	16.1	
71M	98	4.1			4.1
71N	131	11.5	3.4	7.6	
73C	214	0.5	0.5		
75B	525	3.8	1.0	2.8	
75C	101	--			
75D	238	21.8	5.5	15.6	0.8
75E	296	25.9	0.3	0.3	25.3
76C	1,215	6.3		6.3	
76J	99	7.0	2.0	5.0	
76P	618	0.7		0.7	
76W	340	--			
Total	3,978	6.9			

[a]Because of inability to comprehend course material.

DISCUSSION

This research has shown the importance of mathematics aptitude in clerical training school performance. The results are consistent with previous validation research on clerical MOSs. In constructing the ASVAB 8/9/10 composites, Maier and Grafton (1981) found that AR was among the four subtests most predictive of training and job performance in Army clerical occupations However, at that time it was considered important for all the military services to use the same predictors whenever feasible, and the other services preferred to avoid a heavy quantitative loading for the clerical areas. It was decided that the Army would use the same subtests that the Air Force and Marine Corps used to classify clerical personnel (i.e., WK, PC, NO, and CS). The reported loss in validity related to the Skill Qualification Test (SQT) and training performance criteria was 3 points, from .58 to .55 excluding AR (Maier & Grafton, 1981). More recent ASVAB validation research has also found AR to be important in predicting clerical performance (Maier, 1982).

The speeded tests, CS and NO, were not found to be as predictive of clerical performance as would be expected from a conceptual analysis of the job tasks. This may result from attenuation due to unreliability of these subtests in operational use. Compared to power tests, the speeded tests

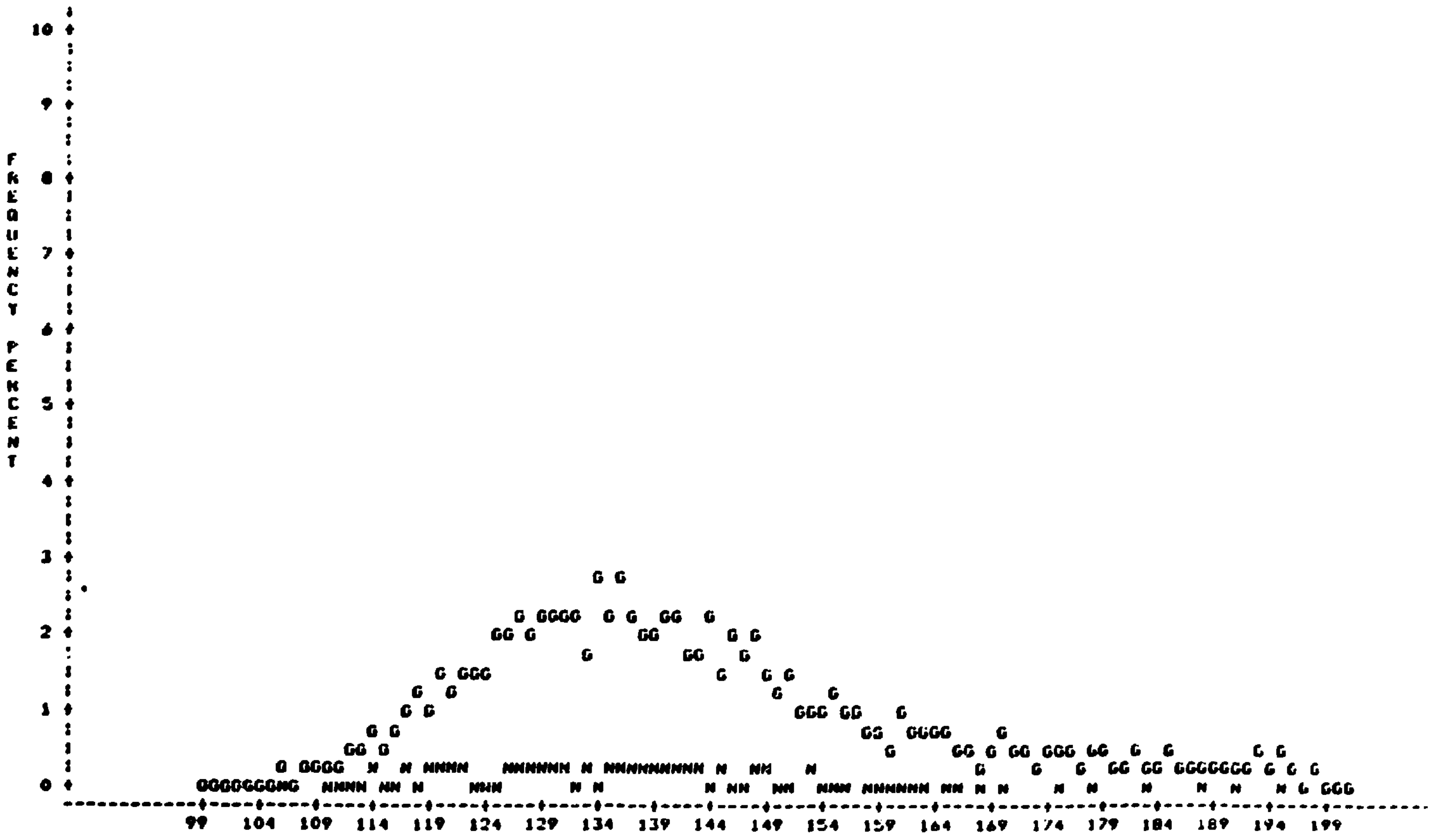

Figure 2. Frequency percent distribution of AR + PC + MK.

G = Training course graduates

N = Training course nongraduates

are subject to additional error variance because of timing and practice effects that tend to reduce their test-retest reliability. McCormick and his associates (1982) found that, when applicants were allowed to retest repeatedly, scores of speeded tests showed the greatest improvement. An ongoing research project at the Army Research Institute will investigate methods that would permit accurate and reliable measurement of job-relevant perceptual skills.

Although the utility analyses revealed that substantial potential savings might be possible from modifying the CL composite, the design of all Army aptitude area composites must be considered within the total context of all the positions to be filled. While a composite of AR, PC, and MK is suggested as an efficient predictor of training performance, possible opportunity costs of loss in differential prediction must also be considered.

While the Arithmetic Reasoning test can predict training success generally, it may be less suitable for classification purposes than a specific predictor such as clerical speed or psychomotor skill, since the AR test would probably predict success equally well in many different areas. ASVAB AR items appear to tap a general problem-solving aptitude in which the arithmetic operations are not explicit but are left to the subject to choose. These skills may be more general than the arithmetic operations called for in the mathematics knowledge subtest. However, adding AR would increase the intercorrelations among the existing classification composites since it is already part of four of the composites in addition to the selector composite. While overall systems optimization cannot be effected in any single research project, ongoing ARI research is designed to address the best structure of all ASVAB Aptitude Area Composites using a large sample of Army MOSs and a variety of performance criteria. In the interim, it appears the composite identified by this research (AR + PC + MK) is the most valid ASVAB composite for clerical soldiers.

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APPENDIX A

SAMPLE ASVAB QUESTIONS

(Adapted from DoD 1304.12Z)

GS General Science

Water is an example of a a) solid b) gas c) liquid d)crystal.

AR Arithmetic Reasoning

A person buys a sandwich for 50¢, soda for 25¢, and pie for 40¢.
What is the total cost?
a) $1.00 b) $1.05 c) $1.15 d) $1.25.

WK Word Knowledge

Small most nearly means
a) sturdy b) round c) cheap d) little.

PC Paragraph Comprehension

The duty of the lighthouse keeper is to keep the light burning no matter what happens, so that ships will be warned of the presence of dangerous rocks. If a shipwreck should occur near the lighthouse even though he would like to aid in the resuce of its crew and passengers, the lighthouse keeper must

a) stay at his light b) rush to their aid c)turn out the light
d) quickly sound the siren.

NO Numerical Operations

2 + 3 =

a) 1 b) 4 c) 5 d) 6

CS Coding Speed

Key

green 2715	man 3451	salt 4586
hat 1413	room. . . . 2864	tree 5972

Answers

room	1413	2715	2864	3451	4586
green	2715	2864	3451	4586	5972
tree	2715	2864	5972	3451	4586

AS Auto and Shop Information

The most commonly used fuel for running automobile engines is

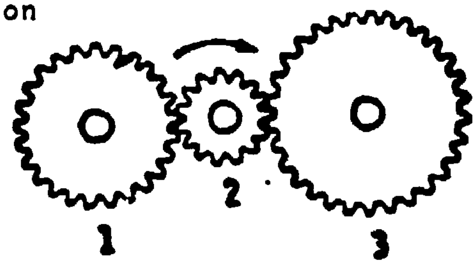
a) kerosene b) benzene c) crude oil d) gasoline.

MK Math Knowledge

If a + 6 = 7 then a is equal to

a) 0 b) 1 c) -1 d) 7/16.

MC Mechanical Comprehension



Which of the other gears is moving in the same direction as gear 2?

a) Gear 1 b) Gear 3 c) Neither of the other gears
d) Both of the other gears.

EI Electronics Information

What does the abbreviation a.c. stand for?

a) additional charge b) alternating coil
c) alternating current d) ampere current

APPENDIX B

DESCRIPTION OF JOB DUTIES FOR SAMPLE CLERICAL MOS

(Adapted from AR 611-201)

71D LEGAL CLERK

Prepares legal correspondence, records, and related papers, such as courts-martial, courts of inquiry, and investigations using knowledge of Uniform Code of Military Justice, Manual for Courts-Martial, Manual of the Judge Advocate General.

71M CHAPEL ACTIVITIES SPECIALIST

Performs chapel and religious support functions, such as religious services, counseling, and education as well as general administration and typing duties.

71N TRAFFIC MANAGEMENT COORDINATOR

Assists in receiving, storing, loading, shipping, and unloading supplies, equipment, household goods, and personal effects. Prepares forms and maintains records covering inbound and outbound shipments, recording quantity and condition of property, claims for adjustments for property lost or damaged in shipment.

73C FINANCE SPECIALIST

Performs duties pertaining to pay, leave, travel and maintenance of personnel finance records of military personnel and other finance functions, such as quality edit, disbursing and travel, and general administration.

75B PERSONNEL ADMINISTRATION SPECIALIST

Performs personnel and administrative functions such as personnel actions, personnel accountability (SIDPERS), typing, and general administration.

75C PERSONNEL MANAGEMENT SPECIALIST

Participates in occupational classification and management of manpower resources, such as assignment, replacement, promotion, reduction, classification, evaluation, testing, as well as typing and general administration.

75D PERSONNEL RECORDS SPECIALIST

Maintains officer and enlisted personnel records in records section of personnel activity, to include in/out processing, personnel records maintenance, and preparation of SIDPERS input and control data.

75E PERSONNEL ACTIONS SPECIALIST

Processes personnel actions concerning service members and their dependents, counseling and referring individuals to appropriate support facilities, preparing documentation for reenlistment, discharge certificates, casualty reports.

76C EQUIPMENT RECORDS & PARTS SPECIALIST

Performs duties involving supply of repair parts and maintenance of equipment records. Receives, stores, and issues repair parts. Initiates and keeps records on equipment use and operation.

76J MEDICAL SUPPLY SPECIALIST

Performs requisitioning, receipt, inventory management, storage, preservation, issue, salvage, stock control and accounting of medical supplies and equipment.

76P MATERIAL CONTROL AND ACCOUNTING SPECIALIST

Performs management or stock record functions pertaining to receipt distribution, and issue of Class II, IV, VI, VII and IX material. Performs accounting, editing, document control, record keeping, sales, and direct exchange of such material.

76W PETROLEUM SUPPLY SPECIALIST

Operates and maintains storage and transfer equipment for petroleum products. Distributes petroleum by connecting tanks, operating pump engines, and opening valves to transfer petroleum. Reads meters and gauges and verifies amount and type of petroleum in storage.

Intercorrelations Between ASVAB Subtests for Profile Study Sample

(N=9173)

	ASVAB Subtest									
	AR	WK	PC	NO	GS	CS	AS	MK	MC	EI
AR	–									
WK	.71	–								
PC	.67	.80	–							
NO	.63	.60	.60	–						
GS	.72	.80	.69	.52	–					
CS	.51	.55	.56	.70	.45	–				
AS	.53	.52	.42	.29	.64	.22	–			
MK	.83	.67	.64	.62	.69	.52	.41	–		
MC	.68	.59	.52	.40	.70	.33	.74	.60	–	
EI	.66	.68	.57	.41	.76	.34	.75	.58	.74	–

AR = Arithmetic Reasoning
WK = Word Knowledge
PC = Paragraph Comprehension
NO = Numerical Operations
GS = General Science
CS = Coding Speed
AS = Auto and Shop Information
MK = Mathematics Knowledge
MC = Mechanical Comprehension
EI = Electronics Information

Source: Profile of American Youth, 1980 Nationwide Administration of the Armed Services Vocational Aptitude Battery, Office of the Assistant Secretary of Defense (MRA&L), March 1982.